Confidence of veterinary surgeons in the United Kingdom in treating and diagnosing exotic pet species

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ABSTRACT

Background: With exotic pet species commonplace in the United Kingdom, owners are increasingly seeking veterinary advice regarding the health and welfare of their small mammals and reptiles. This study aimed to assess the confidence of veterinarians in the UK in treating and diagnosing rabbits, guinea pigs, small mammals and reptiles.

Methods: A forty-one question survey was promoted via social media, including on interest groups focussed specifically at veterinary professionals. A total of n = 131 practicing veterinarians in the United Kingdom completed the questionnaire.

Results: There was a significant effect ($p<0.01$) of frequency of presentation of exotic pets to a practice on the confidence of the veterinarian in treating them. Veterinarians that were presented with exotics more frequently had increased self-reported knowledge of their health and disease and were more confident treating, diagnosing and anaesthetising them. Knowledge of and confidence in diagnosing and treating exotic pets was significantly less than for dogs and cats ($p<0.001$). Veterinarians that had been qualified longer were more confident in treating these species ($p<0.01$).

Conclusions: Increased provision and engagement with CPD may increase veterinary confidence in diagnosing, treating and anaesthetising exotic pet species that are less commonly encountered in practice.

INTRODUCTION

Current figures indicate that 0.6 million rabbits, 0.4 million guinea pigs, 0.5 million small rodents (hamsters, gerbils and rats), 0.8 million reptiles are kept as household pets in the UK [1]. Whilst these numbers are much lower than reported for dogs (9.0 million) and cats (7.5 million), when combined, they still represent a significant number (2.3 million) of animals that could be presented for veterinary treatment. These may also be conservative figures as a recent survey conducted by the PDSA suggested that 0.9 million rabbits are currently owned in the UK [2]. Consequently, the demand for appropriate veterinary care of a range of exotic pet species has increased [3]. For diagnosis and treatment of exotic pet species to be successful, all veterinary staff should have an understanding of species-specific normal and abnormal behaviour [3,4], biology, husbandry and medical parameters as well as being able to effectively monitor anaesthesia [5]. Furthermore, it has been proposed that the majority of health problems occurring in exotic species are due to inadequate husbandry provided by owners [6]. Therefore, it is crucial that veterinary surgeons provide practical education to owners regarding husbandry [7]. This is of particular importance considering that owners may obtain incorrect or contradictory information from internet resources [8,9].

Current attitudes and knowledge towards exotic species are purportedly similar to cats twenty-five years prior, where treatment of the feline patient was still a relatively under-researched area with lower levels of veterinary confidence [10]. Concerns have also been raised regarding the lack of awareness of the differing clinical requirements amongst exotic species, with one author suggesting that treating guinea pigs (and other rodents) as ‘small rabbits’ is a common but harmful misconception that prevails among some clinicians [11]. Another factor that complicates the effective clinical treatment of exotic species is that many are prey species which exhibit a tendency to hide illness and pain better than cats and dogs [12,13]. Consequently, patients are often not seen by a veterinary surgeon until they are a critical case [3]. Studies have also demonstrated that during anaesthesia, the mortality rates of exotic patients are much higher than of cats and dogs [14,15] possibly as a result of a smaller scope for elective surgeries and a lack of specific exotic patient anaesthetic equipment [15].

It has been proposed to the American Veterinary Medical Association (AVMA) that the problem of lack of specialist knowledge amongst veterinary graduates in the United States could be mitigated though increased specialism in education and specific licenses being allocated based on a student’s chosen area of academic focus (including companion exotics as an option) [16]. However, detractors suggest that this approach might prevent unanticipated career changes for graduates [17]. A questionnaire based study conducted in the Netherlands identified a higher than anticipated percentage (10%) of consultations involving exotic species and recommended that in order to prepare veterinary students appropriately for companion animal practice, an attempt should be made to increase clinical exposure to avian and exotic animal diseases [18].

Veterinarians in the UK are required to engage in mandatory Continued Professional Development (CPD) [19]. In a study investigating attitudes of veterinarians towards CPD in the UK, recent graduates were more intrinsically and extrinsically motivated to

participate. Perceived barriers to participation in CPD included it not being provided at a convenient time, location or level and a lack of workplace support [20]. If more recent graduates are more motivated to participate in CPD it could be hypothesised that they are more confident in dealing with exotic pet species, conversely, more experienced graduates may have encountered more cases of these species in clinical practice over time.

The aim of this study was to investigate whether UK based first opinion veterinary surgeons report a lack of knowledge and confidence when dealing with exotic species and whether they feel willing and able to undertake CPD to increase their confidence when presented with these species in practice.

MATERIALS AND METHODS

Ethical approval for this study was granted from Hartpury University ethics committee on 6th November 2018 (ETHICS2018-08).

Questionnaire Distribution

A forty-one question questionnaire was created and published online from 2nd January 2019 to the 30th April 2019. Distribution of the online survey was achieved via the social media site Facebook, alongside promotion by The Veterinary Times and the Rabbit Welfare Association and Fund. The questionnaire was also promoted directly to practices in which industry contacts had already been established. There was no incentive to complete the survey; it was entirely at the discretion of individuals as to whether they wished to participate in the research. Inclusion criteria dictated that participants had to be a currently practicing RCVS registered veterinary surgeon resident within the UK and working in a first opinion small animal or mixed practice.

Informed Consent

All participants were over the age of eighteen and were required to read an informed consent paragraph prior to clicking to start the survey. The introductory paragraph also included information on the purpose of the survey and data protection. All participants were made aware that they had the right to withdraw their responses up to the point of data processing. Respondents were asked to create a unique six-digit identifier so that their responses could be identified if they wished to withdraw.

Questionnaire Design

The questionnaire included multiple choice, Likert scale and open-ended questions divided into four sections. The first section asked respondents to provide some basic demographic information including the location of their practice, how long they had been qualified, their age and the country in which they completed their veterinary degree. The second section asked respondents to provide some information about the frequency with which they are presented with different exotic species in practice. Options available included ‘daily’, ‘twice weekly’,‘weekly’,’fortnightly’, ‘monthly’, ‘yearly’ and ‘never’.

Section three asked respondents to rate on a scale of one to ten their knowledge and confidence in diagnosing and treating cats and dogs, rabbits, guinea pigs, small rodents (mice, rats, gerbils, hamsters and degus) and reptiles individually. For questions rating knowledge, one equalled least knowledgeable and ten equalled most knowledgeable. For questions rating confidence, one equalled not at all confident and ten equalled fully confident. For the question where respondents were asked to rate their knowledge, feline and canine health and disease were separated, whereas for questions assessing confidence cats and dogs were combined.

In the final section, respondents were asked what they thought were the main barriers to developing knowledge confidence in treating exotic pet species presented with in practice (for example; low numbers of these pets seen in practice, lack of interest in these species amongst veterinary professionals). Respondents were asked to state whether they felt current opportunities for exotic pet CPD were sufficient, whether they would be interested in engaging with further CPD and if their veterinary degree had contained sufficient content on these species. Veterinarians were also asked to state whether they felt that exotic patient welfare is compromised by a lack of knowledge and confidence among veterinary professionals.

Data Analysis

Data collected were non-parametric due to the categorical and ordinal options for questions. All statistical analyses were performed in the statistical software package R version 3.5.1; packages FSA, plyr, pastecs and PMCMR [21]. The effect of demographic factors and frequency of species presented to the practice on veterinary confidence was tested using Kruskal-Wallis tests. Where categories contained five or less respondents, these were removed from statistical analysis. Where significance was identified in the main test ($p<0.05$) Dunn's post-hoc tests with the Bonferroni correction applied were used to identify significant differences between categories, reported adjusted p-values were significant at $p<0.05$. To test for an effect of species on veterinary confidence, a Friedman ANOVA was performed, where significant differences were identified, a Nemenyi post-hoc was performed, this test is conservative and accounts for a family-wise error hence no p-value adjustment was performed.

RESULTS

A total of 131 respondents completed the questionnaire in full. These were all practicing veterinary surgeons working in first opinion small animal practice in the UK.

Respondent demographics

The majority of respondents were from England (80.92%; n=106), with the remainder split between Wales (8.40%; n=11), Scotland (7.63%; n=10) and Northern Ireland (3.05%; n=4). Twelve point two percent (n=16) of respondents were male, 85.50% (n=112) were female and 2.29% (n=3) preferred not to say. Of the respondents 43.51% (n=57) were aged 21-30, 31.30% (n=41) were aged 31-40, 15.27% (n=20) were aged 41-50, 8.40% (n=11) were aged 51-60. The length of time respondents had been qualified varied with 9.16% (n=12) qualified for less than 1 year, 29.01% (n=38) qualified between 1-5 years, 24.43% (n=32) qualified between 6-10 years, 12.98%

(n=17) qualified between 11-15 years, 9.16% (n=12) qualified between 16-20 years and 15.28% (n=20) qualified over 20 years.

The effect of species on knowledge and confidence in diagnosis, treatment and anaesthesia.

There was a significant main effect of species on a veterinarian's self-rated knowledge of health and disease ($X^2_5 = 479.62$, $p<0.001$; Figure 1). There was no significant difference between knowledge of canine and feline health and disease ($p=0.735$). There were significant differences ($p<0.05$) in knowledge of the health and disease of all other species (Table 1). There was a significant main effect of species on a veterinarian's confidence in treating and diagnosing ($X^2_4 = 383.33$, $p<0.001$; Figure 1). There were significant differences ($p<0.05$) in confidence treating and diagnosing all species (Table 1). There was a significant main effect of species on a veterinarian's confidence in anaesthetising ($X^2_4 = 389.46$, $p<0.001$; Figure 1). There was no significant difference in confidence anaesthetising guinea pigs and small rodents ($p=0.340$). There were significant differences in confidence anaesthetising all other species (Table 1).

Table 1. Pairwise comparisons of the effect of species on knowledge of health and disease, confidence treating and diagnosing and confidence anaesthetising. Exact p-values are shown apart from for $p<0.001$. Reported p-values are significant at $p<0.05$ (*), $p<0.01$(**) and $p<0.001$(***). Categories with less than or equal to five respondents were not included in statistical analysis.

Knowledge of Health and Disease					
	Dogs	Rabbits	Guinea Pigs	Small Rodents	Reptiles
Cats	0.735	<0.001***	<0.001***	<0.001***	<0.001***
Dogs	-	<0.001***	<0.001***	<0.001***	<0.001***
Rabbits	-	-	0.002**	<0.001***	<0.001***
Guinea Pigs	-	-	-	0.024*	<0.001***
Small Rodents	-	-	-	-	0.019*
Confidence Treating and Diagnosing					
	Rabbits		Guinea Pigs	Small Rodents	Reptiles
Cats and Dogs	<0.001***		<0.001***	<0.001***	<0.001***
Rabbits	-		<0.001***	<0.001***	<0.001***
Guinea Pigs	-		-	0.005**	<0.001***
Small Rodents	-		-	-	<0.001***
Confidence in Anaesthetising					
	Rabbits		Guinea Pigs	Small Rodents	Reptiles
Cats and Dogs	<0.001***		<0.001***	<0.001***	<0.001***

Rabbits	-	<0.001***	<0.001***	<0.001***
Guinea Pigs	-	-	-	0.340
Small Rodents	-	-	-	<0.001***

The effect of the frequency of exotic pets seen on knowledge and confidence in diagnosis, treatment and anaesthesia.

The frequency of presentation of different exotic pet species can be seen in Table 2.

Table 2. Frequency of presentation of exotic pet species to the veterinary practice. The percentage of veterinarians (out of a total of n = 131) that selected each category is indicated beneath the number of animals seen. Categories with less than or equal to five respondents were not included in statistical analysis.

Species	**Frequency of Presentation**						
	Daily	Twice Weekly	Weekly	Fortnightly	Monthly	Yearly	Never
Rabbits	n = 42 (32.00%)	n = 35 (26.72%)	n = 20 (15.27%)	n = 18 (13.74%)	n = 13 (9.99%)	n = 2 (1.15%)	n = 1 (0.76%)
Guinea Pigs	n = 12 (9.16%)	n = 34 (25.95%)	n = 23 (17.56%)	n = 26 (19.85%)	n = 32 (24.43%)	n = 2 (1.15%)	n = 2 (1.15%)
Small Rodents	n = 9 (6.87%)	n = 24 (18.32%)	n = 20 (15.27%)	n = 28 (21.37%)	n = 40 (30.53%)	n = 9 (6.87%)	n = 1 (0.76%)
Reptiles	n = 7 (5.34%)	n = 9 (6.87%)	n = 7 (5.34%)	n = 6 (4.58%)	n = 27 (20.61%)	n = 45 (34.35%)	n = 30 (22.90%)

Rabbits

There was a significant main effect ($X^2_4 = 30.24$, $p<0.001$) of frequency of rabbits seen on knowledge of rabbit health and disease. There was a significant main effect ($X^2_4 = 24.14$, $p<0.001$) of frequency of rabbits seen on confidence in diagnosing and treating rabbits. There was a significant main effect ($X^2_4 = 30.95$, $p<0.001$) of frequency of rabbits seen on confidence in anaesthetising rabbits. Overall, veterinarians that were presented with rabbits more frequently rated themselves as more knowledgeable and were more confident in treating, diagnosing anaesthetising them. Significant effects ($p<0.05$) of frequency of presentation on knowledge of health and disease, confidence in treating and diagnosing and anaesthetising are shown in Table 3.

Table 3. Pairwise comparisons of the effect of frequency of presentation on knowledge of rabbit health and disease, confidence treating and diagnosing and confidence anaesthetising rabbits. Exact adjusted p-values are shown apart from for $p<0.001$. Reported p-values are significant at $p<0.05$ (*), $p<0.01$(**) and $p<0.001$(***).

Categories with less than or equal to five respondents were not included in statistical analysis.

Knowledge of Health and Disease				
	Twice weekly	Weekly	Fortnightly	Monthly
Daily	0.437	0.027*	0.004**	<0.001***
Twice weekly	-	0.403	0.177	0.004**
Weekly	-	-	0.515	0.223
Fortnightly	-	-	-	0.333
Confidence Treating and Diagnosing				
	Twice weekly	Weekly	Fortnightly	Monthly
Daily	0.257	0.216	0.048*	<0.001***
Twice weekly	-	0.760	0.853	0.017*
Weekly	-	-	0.978	0.067
Fortnightly	-	-	-	0.219
Confidence in Anaesthetising				
	Twice weekly	Weekly	Fortnightly	Monthly
Daily	0.312	0.102	0.087	<0.001***
Twice weekly	-	0.762	1.000	<0.001***
Weekly	-	-	0.948	0.022*
Fortnightly	-	-	-	0.028*

Guinea Pigs

There was a significant main effect ($X^2_4 = 28.18$, $p<0.001$) of frequency of guinea pigs seen on knowledge of guinea pig health and disease. There was a significant main effect ($X^2_4 = 19.31$, $p<0.001$) of frequency of guinea pigs seen on confidence in diagnosing and treating guinea pigs There was a significant main effect ($X^2_4 = 25.27$, $p<0.001$) of frequency of guinea pigs seen on confidence in anaesthetising guinea pigs. Overall, veterinarians that were presented with guinea pigs more frequently rated themselves as more knowledgeable and were more confident in treating, diagnosing anaesthetising them. Significant effects ($p<0.05$) of frequency of presentation on knowledge of health and disease, confidence in treating and diagnosing and anaesthetising are shown in Table 4.

Table 4. Pairwise comparisons of the effect of frequency of presentation on knowledge of guinea pig health and disease, confidence treating and diagnosing and confidence anaesthetising guinea pigs. Exact adjusted p-values are shown apart from for $p<0.001$. Reported p-values are significant at $p<0.05$ (*), $p<0.01$(**) and $p<0.001$(***).

Knowledge of Health and Disease				
	Twice weekly	Weekly	Fortnightly	Monthly
Daily	0.388	0.021*	0.285	<0.001***
Twice weekly	-	0.251	0.552	<0.001***
Weekly	-	-	0.337	0.414
Fortnightly	-	-	-	0.018*
Confidence Treating and Diagnosing				
	Twice weekly	Weekly	Fortnightly	Monthly
Daily	0.824	0.725	0.778	0.004**
Twice weekly	-	1.000	1.000	0.002**
Weekly	-	-	0.843	0.137
Fortnightly	-	-	-	0.068
Confidence in Anaesthetising				
	Twice weekly	Weekly	Fortnightly	Monthly
Daily	0.628	0.127	0.357	0.002**
Twice weekly	-	0.096	0.293	<0.001***
Weekly	-	-	0.917	0.423
Fortnightly	-	-	-	0.119

Small Rodents (mice, gerbils, rats, hamsters and degus)

There was a significant main effect ($X^2_5 = 29.44$, $p<0.001$) of frequency of small rodents seen on knowledge of small rodent health and disease. There was a significant main effect ($X^2_5 = 27.52$, $p<0.001$) of frequency of small rodents seen on confidence in diagnosing and treating small rodents. There was a significant main effect ($X^2_5 = 19.12$, $p<0.01$) of frequency of small rodents seen on confidence in anaesthetising small rodents. Overall, veterinarians that were presented with small rodents more frequently rated themselves as more knowledgeable and were more confident in treating, diagnosing anaesthetising them. Significant effects ($p<0.05$) of frequency of presentation on knowledge of health and disease, confidence in treating and diagnosing and anaesthetising are shown in Table 5.

Table 5. Pairwise comparisons of the effect of frequency of presentation on knowledge of small rodent health and disease, confidence treating and diagnosing and confidence anaesthetising small rodents. Exact adjusted p-values are shown apart from for $p<0.001$. Reported p-values are significant at $p<0.05$ (*), $p<0.01$(**) and $p<0.001$(***). Categories with less than or equal to five respondents were not included in statistical analysis.

Knowledge of Health and Disease					
	Twice weekly	Weekly	Fortnightly	Monthly	Yearly
Daily	0.567	0.019*	0.010*	0.002**	<0.001***
Twice weekly	-	0.213	0.101	0.019*	0.003**
Weekly	-	-	0.905	1.000	0.330
Fortnightly	-	-	-	1.000	0.386
Monthly	-	-	-	-	0.439
Confidence Treating and Diagnosing					
	Twice weekly	Weekly	Fortnightly	Monthly	Yearly
Daily	0.581	0.085	0.032*	*<0.05	<0.001***
Twice weekly	-	0.560	0.208	0.106	<0.001***
Weekly	-	-	1.000	1.000	0.066
Fortnightly	-	-	-	0.850	0.080
Monthly	-	-	-	-	0.076
Confidence in Anaesthetising					
	Twice weekly	Weekly	Fortnightly	Monthly	Yearly
Daily	0.802	0.221	0.033*	0.022*	0.004**
Twice weekly	-	1.000	0.422	0.339	0.054
Weekly	-	-	0.893	1.000	0.428
Fortnightly	-	-	-	0.971	0.676
Monthly	-	-	-	-	0.760

Reptiles

There was a significant main effect ($X^2_6 = 66.96$, $p<0.001$) of frequency of reptiles seen on knowledge of reptile health and disease. There was a significant main effect ($X^2_6 = 66.38$, $p<0.001$) of frequency of reptiles seen on confidence in diagnosing and treating reptiles. There was a significant main effect ($X^2_6 = 68.63$, $p<0.001$) of frequency of reptiles seen on confidence in anaesthetising reptiles. Overall, veterinarians that were presented with reptiles more frequently rated themselves as more knowledgeable and were more confident in treating, diagnosing anaesthetising them. Significant effects ($p<0.05$) of frequency of presentation on knowledge of health and disease, confidence in treating and diagnosing and anaesthetising are shown in Table 6.

Table 6. Pairwise comparisons of the effect of frequency of presentation on knowledge of reptile health and disease, confidence treating and diagnosing and confidence

anaesthetising reptiles. Exact adjusted p-values are shown apart from for $p<0.001$. Reported p-values are significant at $p<0.05$ (*), $p<0.01$(**) and $p<0.001$(***). Categories with less than or equal to five respondents were not included in statistical analysis.

Knowledge of Health and Disease						
	Twice weekly	Weekly	Fortnightly	Monthly	Yearly	Never
Daily	1.000	1.000	1.000	0.576	<0.001***	<0.001***
Twice weekly	-	0.972	1.000	1.000	0.003**	<0.001***
Weekly	-	-	1.000	1.000	0.014*	<0.001***
Fortnightly	-	-	-	1.000	0.034*	0.003**
Monthly	-	-	-	-	<0.001***	<0.001***
Confidence Treating and Diagnosing						
	Twice weekly	Weekly	Fortnightly	Monthly	Yearly	Never
Daily	1.000	1.000	1.000	0.394	<0.001***	<0.001***
Twice weekly	-	1.000	1.000	1.000	0.006**	<0.001***
Weekly	-	-	0.905	1.000	0.006**	<0.001***
Fortnightly	-	-	-	1.000	0.024*	0.002**
Monthly	-	-	-	-	0.001**	<0.001***
Confidence in Anaesthetising						
	Twice weekly	Weekly	Fortnightly	Monthly	Yearly	Never
Daily	0.848	0.390	0.748	0.048*	<0.001***	<0.001***
Twice weekly	-	1.000	0.875	1.000	0.006**	<0.001***
Weekly	-	-	1.000	1.000	0.148	<0.01***
Fortnightly	-	-	-	1.000	0.064	0.008**
Monthly	-	-	-	-	0.005**	<0.001***
Yearly	-	-	-	-	-	0.557

The effect of length of time qualified on knowledge and confidence in diagnosis, treatment and anaesthesia.

Rabbits

There was a significant main effect ($X^2_6 = 26.44$, $p<0.001$) of length of time qualified on knowledge of rabbit health and disease. Veterinarians that had been qualified less than a year ($p=0.018$) or between one and five years ($p=0.015$) rated themselves as

297 significantly less knowledgeable of rabbit health and disease as those that had been
298 qualified between 16 and 20 years. There was a significant main effect ($X^2_6 = 27.37$,
299 $p<0.001$) of length of time qualified seen on confidence in diagnosing and treating
300 rabbits. Veterinarians that had been qualified less than a year were less confident than
301 those that had been qualified between 11 and 15 years ($p=0.014$), between 16 and 20
302 years ($p=0.002$) and between 21 and 25 years ($p=0.015$). Veterinarians that had been
303 qualified between one and five years were significantly less confident than those that
304 had been qualified between 16 and 20 years ($p=0.015$). There was a significant main
305 effect ($X^2_6 = 29.56$, $p<0.001$) of length of time qualified on confidence in anaesthetising
306 rabbits. Veterinarians that had been qualified less than a year were less confident
307 anaesthetising rabbits than those that had been qualified between 11 and 15 years
308 ($p<0.001$) and between 16 and 20 years ($p=0.006$). Veterinarians that had been
309 qualified between one and five years were significantly less confident than those that
310 had been qualified between 11 and 15 years ($p=0.005$) and 16 and 20 years ($p=0.014$).

311 Guinea Pigs

312 There was a significant main effect ($X^2_6 = 21.85$, $p<0.01$) of length of time qualified on
313 knowledge of guinea pig health and disease. Veterinarians that had been qualified
314 less than a year ($p=0.037$) or between one and five years ($p=0.037$) were significantly
315 less knowledgeable than those that had been qualified between 11 and 15 years.
316 There was a significant main effect ($X^2_6 = 20.29$, $p<0.01$) of length of time qualified on
317 confidence in diagnosing and treating guinea pigs. Veterinarians that had been
318 qualified less than a year were significantly less confident in diagnosing and treating
319 guinea pigs than those that had been qualified between 6 and 10 years ($p=0.048$) or
320 between 11 and 15 years ($p=0.022$). There was a significant main effect ($X^2_6 = 31.71$,
321 $p<0.001$) of length of time qualified on confidence in anaesthetising guinea pigs.
322 Veterinarians that had been qualified for less than a year were significantly less
323 confident anaesthetising guinea pigs than those that had been qualified for between
324 11 and 15 years ($p<0.001$), between 16 and 20 ($p=0.009$) years and between 21 and
325 25 years ($p=0.027$). Veterinarians that had been qualified between one and five years
326 were significantly less confident than those that had been qualified for between 11 and
327 15 years ($p=0.001$).

328 Small Rodents

329 There was a significant main effect ($X^2_6 = 27.56$, $p<0.001$) of length of time qualified on
330 knowledge of small rodent health and disease. Veterinarians that had been qualified
331 between one and five years were significantly less knowledgeable than those that had
332 been qualified between 11 and 15 years ($p=0.01$) and between 16 and 20 years
333 ($p=0.03$). There was a significant main effect ($X^2_6 = 21.91$, $p<0.001$) of length of time
334 qualified on confidence in diagnosing and treating small rodents. Veterinarians that
335 had been qualified for less than a year or between one and five years were significantly
336 less confident in diagnosing and treating small rodents than those who had been
337 qualified between 11 and 15 years ($p=0.048$) and between 16 and 20 years ($p=0.033$).
338 There was a significant main effect ($X^2_6 = 32.23$, $p<0.001$) of length of time qualified on
339 confidence in anaesthetising small rodents. Veterinarians that had been qualified for
340 less than a year were significantly less confident in anaesthetising small rodents than

those that had been qualified for between 11 and 15 years (p=0.004) and between 16 and 20 years (p=0.004). Veterinarians that had been qualified for between one and five years were significantly less confident than those that had been qualified for between 11 and 15 years (p=0.004) and between 16 and 20 years (p=0.006).

Reptiles

There was no significant effect of length qualified on knowledge of reptile health and disease ($X^2_6 = 10.92$, $p>0.05$). There was no significant effect of length qualified on confidence in diagnosing and treating reptiles ($X^2_6 = 10.12$, $p>0.05$). There was a significant main effect of length qualified on confidence in anaesthetising reptiles ($X^2_6 = 14.33$, $p<0.05$). Veterinarians that had been qualified between one and five years were significantly less confident anaesthetising reptiles than those that had been qualified for between 16 and 20 years (p=0.039).

Continued professional development and training

The majority of respondents (42.75%; n = 56) disagreed that there was adequate content in their veterinary degree on exotic pets, with 29.77% (n=39) strongly disagreeing, 13.74% agreeing (n=18), 10.69% (n = 14) neither agreeing nor disagreeing and 3.05% (n = 4) strongly agreeing. The majority of respondents agreed (36.66%; n=48) that they had sufficient access to exotic pet CPD, 28.24% disagreed (n = 37), 25.20% (n=33) neither agreed nor disagreed and 9.92% (n=13) strongly agreed. The majority of respondents (86.26%; n=113) stated that they would be interested in further training opportunities focussed specifically on exotic pet health and welfare with 13.74% (n=18) stating that they would not be interested in this.

When questioned on what they felt was the main barrier to development of confidence and knowledge in the diagnosis and treatment of exotic pet species, the majority (44.27%; n=58) of respondents selected ‘exotic species seen too infrequently in practice to build experience’; 27.48% (n=36) chose ‘lack of interest in these species amongst veterinary professionals’ and 15.27% (n=20) chose ‘lack of content in degree/university degree programme’. The remaining responses (12.98%; n=17) were split between other categories which included options such as “no career benefit” and “limited time for study”. The majority of respondents agreed (72.75%, n=56) that a lack of confidence and knowledge amongst veterinary professionals compromises the welfare of exotic pet species, 29.77% (n=39) strongly agreed, 16.03% (n=21) neither agreed nor disagreed, 9.16% (n=12) disagreed and 2.29% (n=3) strongly disagreed.

DISCUSSION

In the present study, veterinarians that saw exotic pet species more frequently were more confident in treating, diagnosing and anaesthetising them. Veterinarians that saw rabbits daily rated themselves as significantly more knowledgeable on their health and disease and were more confident in diagnosis, treatment and anaesthesia than those that saw rabbits less frequently. Rabbits were seen more frequently than any other exotic pet species, with the majority of veterinarians surveyed reporting that they saw them daily. However, veterinarians were still significantly less confident in diagnosing, treating and anaesthetising rabbits than cats and dogs. Veterinarians cited lack of frequency of presentation of exotic pet species as the main barrier to them improving

their confidence and knowledge, yet rabbits were seen relatively frequently. However, this question was not sub-divided for different species, so there may have been different barriers for species seen more frequently (e.g. rabbits) compared to reptiles which most respondents saw yearly. In this survey, we did not question veterinarians on how often they saw cats and dogs, but research has shown them to be presented more frequently than rabbits and other species [22]. It is suggested that perhaps seeing a case daily is insufficient to build knowledge through experiential learning as has been reported for other species [23]. The majority of respondents to this survey disagreed that there was sufficient content on exotic pets within the veterinary degree which supports research that suggests that recent graduates need to obtain a number of clinical skills in their first year in practice as opposed to from taught content [24,25]. Therefore, it can be proposed that more formalised taught content in veterinary degrees may be beneficial in building confidence rather than reliance on experience gained during clinical placements and post-graduation.

The second most frequently seen species was guinea pigs, followed by small rodents, then reptiles which is in agreement with current pet ownership statistics for the UK [1,2]. Veterinarians that saw guinea pigs more frequently were more confident in their knowledge and ability. The majority of respondents stated that they saw guinea pigs twice weekly, yet veterinarians were significantly less confident in all areas for this species than for rabbits. This suggests that the difference between presentation daily and twice weekly may result in decreased levels of knowledge and confidence. Rabbits and guinea pigs represent a substantial proportion of patients being presented to the veterinary practice and there is a legislative responsibility for veterinarians to ensure that they are up to date with developments in the care of these species [26]. Over a quarter of respondents felt that a lack of interest in exotic pet species was the greatest barrier to development of knowledge and confidence, yet the majority stated that they would be interested in further CPD opportunities if available. This is positive as CPD enables veterinarians to adapt to developments in the profession and deliver the high quality of care that owners expect [19]. Consequently, exotic pet specific CPD needs to be convenient [20] in addition to practices encouraging exotic interests within the team to develop areas of specialism. Previous research has suggested that increased clinical exposure to exotic species is required for veterinary students and that veterinary curricula should reflect the increasing importance of these species [18].

Veterinarians that had been qualified between eleven and twenty years were the most knowledgeable and confident demographic in treating, diagnosing and anaesthetising exotic pet species. Interestingly, with the exception of treating and diagnosing guinea pigs, veterinarians that had been qualified between six and eleven years were no more confident or knowledgeable than those who had been qualified less than six years. However, caution must be maintained in the interpretation of knowledge data as this was self-reported and more confident, experienced clinicians may perceive themselves to be more knowledgeable than those who have recently graduated. However, veterinarians that had been qualified for longer than twenty years rated themselves as no more knowledgeable or confident than recent graduates. It has been proposed that recent graduates should be provided with appropriate CPD and examples of good practice from experienced veterinarians to build their confidence

and knowledge in a supportive environment [27]. The exception to length of time qualified having a significant effect on knowledge and confidence was in diagnosing and treating reptiles. This is likely related to the infrequent presentation of reptiles and possibly due to veterinarians referring reptiles to a specialist rather than treating and diagnosing them themselves. The RSPCA recommend identifying a reptile veterinarian prior to purchasing a reptile, whereas they do not specify the requirement for an exotic veterinarian in their guidance on pet rodents or rabbits [28].

Knowledge of and confidence in treating, diagnosing and anaesthetising exotic pet species was significantly less than for cats and dogs, with the majority of respondents agreeing that this represented a welfare concern for these species. Consequently, work needs to be done to understand how this can be addressed, particularly for rabbits and guinea pigs that are seen frequently by small animal vets. This survey only surveyed 131 veterinarians practicing within the UK and as such, the results are not generalisable to all clinicians within the UK, with further research required to identify whether the results are consistent with other countries. Future work could assess the knowledge of veterinarians surrounding the health and disease of these species to identify a potential skills gap.

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FIGURE CAPTIONS

Figure 1. Species difference in veterinary knowledge and confidence. Mean values are shown for knowledge of health and disease, confidence diagnosing and treating and confidence anaesthetising all species. Error bars represent standard error of the mean. Knowledge and confidence were rated on a scale of one to ten. For knowledge, one equalled least knowledgeable and ten equalled most knowledgeable. For questions rating confidence, one equalled not at all confident and ten equalled fully confident.

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